

Hemorrhagic shock 3 days after catheterization from the axillary vein

Taiichi Shinzato · Michihiko Fukui ·
Kunihiko Kooguchi · Masahiro Sakaguchi ·
Woo Jin Joo

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Abstract A 72-year-old woman presented pulmonary embolism. Continuous intravenous administration of heparin was controlled with values of activated clotting time targeted from 150 to 180 s. On the sixth intensive care unit (ICU) day, a central vein (CV) catheter was inserted through the right axillary vein. On the ninth ICU day, her blood pressure dropped and her right breast was obviously larger than the left. Chest computed tomography showed a large hematoma under the greater pectoral muscle. CV catheterization under anticoagulant therapy is risky for bleeding, but catheterization of the internal jugular vein rarely leads to hemorrhagic shock, even if it causes airway obstruction. The axillary vein is in a compartment filled with loose tissue. As there is no structure to cover the bleeding site, the hematoma would expand from the lateral region of the thorax to near the fifth or sixth rib, to which greater and smaller pectoral muscles are attached. Ultrasound-guided catheterization from the axillary vein is introduced as a new and promising alternative to that from the subclavian vein because of its safety, but we should be

conservative about applying the axillary approach to patients with anticoagulant therapy, especially in case of an unskilled operator, and be aware of the possibility of late-onset bleeding.

Keywords Axillary vein · Catheterization · Anticoagulation · Hemorrhagic shock

Introduction

Ultrasound-guided catheterization from the axillary vein is introduced as a new and promising alternative to that from the subclavian vein because an axillary vein is easily imaged and relatively distant from thoracic cage of which penetration is one of the major complications of the procedure [1, 2]. We routinely use the axillary approach and experienced a case of hemorrhagic shock 3 days after catheterization. This case revealed a pitfall in the new procedure.

Case report

A 72-year-old woman developed chest pain and dyspnea as a result of shock after release from 17-h bed rest following renal biopsy. Soon after arrival to intensive care unit (ICU), cardiopulmonary resuscitation (CPR) was performed for her circulatory collapse. Tissue plasminogen activator (16×10^5 unit) was administered to treat suspected pulmonary embolism. In addition to ordinary CPR and mechanical ventilation, we started percutaneous cardiopulmonary support (PCPS), which led to restored spontaneous circulation (RSC) and respiration within an hour after the event. Anuria was continued after RSC, which needed support with continuous hemodialysis (CHD).

T. Shinzato (✉) · M. Fukui · K. Kooguchi · M. Sakaguchi ·
W. J. Joo

Department of Emergency and Intensive Care Medicine,
Otsu City Hospital, 2-9-9 Motomiya,
Otsu, Siga 520-0804, Japan
e-mail: sin2sin3jp@yahoo.co.jp

M. Fukui
e-mail: drfuuu@yahoo.co.jp

K. Kooguchi
e-mail: koochanjp@yahoo.co.jp

M. Sakaguchi
e-mail: masahiroken@yahoo.co.jp

W. J. Joo
e-mail: kuma7878@hotmail.com

These mechanical PCPS, ventilation, and CHD supports were continued for 2, 6, and 8 days, respectively, and the ICU time course is summarized in Fig. 1. Continuous i.v. administration of heparin was controlled with the values of activated clotting time (ACT) targeted from 150 to 180 s, and the ACT target was increased to 200–250 s during PCPS.

On the sixth ICU day, the patient’s circulation and respiration were totally restored without neurological dysfunction. We inserted a central vein (CV) catheter through the right axillary vein for parenteral nutrition. The ultrasound-guided catheterization was performed smoothly, and its proper placement was confirmed. At that time, ACT was 164 s and prothrombin time–international normalized ratio (PT-INR) was 1.19. On the seventh ICU day, she was begun on warfarin. On the ninth ICU day, her blood pressure dropped suddenly, and her right breast was obviously larger than the left. Chest computed tomography (CT) showed a large hematoma under the greater pectoral muscle (Fig. 2). We removed the CV catheter, pressed the

vein transcutaneously, and inserted a wound suction tube into the hematoma. About 1000 ml of blood was collected, which required >2000 ml of blood transfusion. PT-INR was 1.18 on the day.

On the fourteenth day, the decreased bleeding of <30 ml/day from the drain allowed her to leave ICU.

Discussion

Several venous approaches are clinically used CV catheterization. The internal jugular vein is probably the most appropriate route due to low complication rates compared with other sites [3–5]. The femoral-vein approach has a high incidence of complications, especially infection and thrombosis [3–5]. The subclavian approach also has serious complications, such as pinch-off syndrome and pneumothorax [6]. Regardless of these risks, a CV catheter is often inserted through the subclavian vein because it is much less disturbing for the patient than through the other locations. The ultrasound-guided infraclavicular axillary vein approach is thought to be as safe as the internal jugular one and as comfortable as the subclavian approach for the following reasons: (1) The axillary vein lies away from the thoracic cage, which reduces the risk of pneumothorax [1, 2]. (2) The axillary vein is easily imaged with ultrasound, thus avoiding arterial puncture or nerve injury [1, 2]. (3) In axillary artery puncture, it is easy to compress the artery [2].

Our case showed that some possibility of bleeding still remains in the axillary approach. The bleeding spread under the greater pectoral muscle and formed a huge hematoma. In this case, anticoagulant therapy might have some influence on the late onset of the hematoma. Needless to say, central venous catheterization under anticoagulant therapy is risky for bleeding, but catheterization of the internal jugular vein rarely leads to hemorrhagic shock, even if it causes airway obstruction.

This rapid expansion may be associated with anatomical structure: The axillary vein is in a compartment filled with loose tissue, constructed with smaller pectoral muscle, anterior serratus muscle, and subclavian muscle. As there is no structure to cover the bleeding site of the axillary vein, a hematoma would expand from the lateral region of the thorax to near the fifth or sixth rib, to which greater and smaller pectoral muscles are attached. This anatomical feature also leads us to believe that it is difficult to keep the rest of the catheter in the vein when the patient moves the arm. Our patient started rehabilitation of both of upper limbs on the seventh ICU day after catheterization of the right axillary vein. Her blood pressure and hemoglobin dropped to 120 mmHg from 160 mmHg and to 9.1 g/dl from 10.1 g/dl, respectively, the next day. Therefore, the

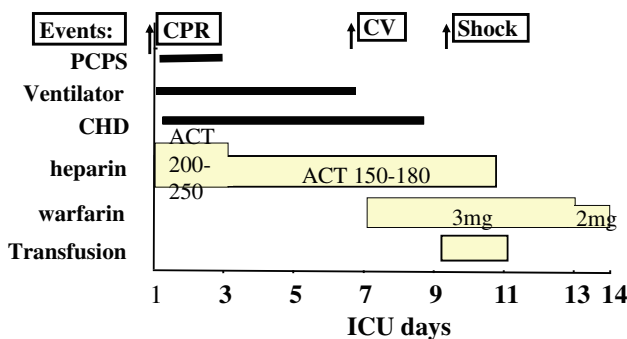


Fig. 1 Intensive care unit (ICU) time course. CPR cardiopulmonary resuscitation, CV central vein catheterization, Shock blood pressure drop to 70/40 mmHg, PCPS percutaneous cardiopulmonary support, CHD continuous hemodialysis

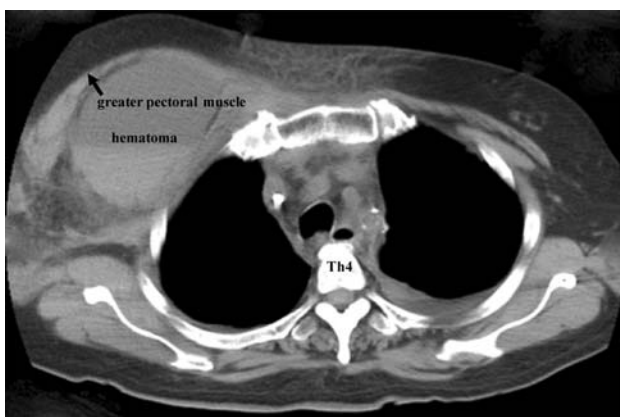


Fig. 2 A huge hematoma surrounded by the greater pectoral muscle, smaller pectoral muscle, anterior serratus muscle, and subclavian muscle

rehabilitation could cause a slight movement of the catheter in the vein and lead to bleeding. Additionally, a hematoma under the greater pectoral muscle is too deep to be noticed by change of skin color and slight swelling. In this case, the decrease in blood pressure alerted us to the possibility of bleeding and resulted in finding the enlargement of the right breast.

Few complications have been reported about the recently introduced axillary approach, which might have been clinically applied to many patients. The real-time echo-guided approach does not always guarantee successful catheterization by unskilled clinicians at their first try. A small amount of bleeding under anticoagulant therapy would continue to spread under the greater pectoral muscle, and moreover, it is not easy to identify. This case made us aware of the possibility of massive bleeding after the procedure. We believe being conservative about applying the axillary approach to patients with anticoagulant therapy is essential, especially in the case of an unskilled operator,

and the possibility of late-onset bleeding must be kept in mind.

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